

Serial No. 09/486,864
Docket No. 28569.5100

REMARKS

Applicants reply to the Office Action mailed on March 10, 2006, and submit a one month Petition for Extension of Time. Claims 21, 22, 24-30, and 33 (2 independent claims and 10 total claims) remain pending in the application. The Examiner rejects claims 21, 22, 24, 29 and 30 and objects to claims 25-28 and 33 in the subject application. Reconsideration of this application is respectfully requested.

Applicants thank the Examiner for the indication of allowable subject matter in claims 25-28 and 33. However, Applicants request clarification of the allowability of claim 33 because the Examiner also rejects claim 33 in Point 6 of the present Office Action.

Claims 21, 24, and 29 are rejected as being obvious over Zong, et al., EP 0 239 914 ("Zong"), in view of Kehry, et al., DE 38 44 572 ("Kehry"), in further view of Hayakawa, JP 06-072253 ("Hayakawa"). Applicants respectfully traverse this rejection.

The Examiner admits that Zong fails to disclose that the loudspeaker system is a dipole speaker. The Examiner asserts that Kehry teaches a dipole speaker.

Zong describes an electronic loudspeaker which comprises a characteristic wave shape generator, an attenuator, an amplifier, a loudspeaker, and a controller, designed on the basis of the principle of harmony and acoustics. The electronic loudspeaker is suitable for various transport means for safe driving (see the Abstract of Zong).

Kehry describes a roof mounted indicator device which is provided with a visual and audible warning and indicator means for emergency services vehicles. The device includes loudspeakers 11 with funnels 12 and/or the covering grid plates 10 for heating and the prevention of unwanted freezing. Further, the sound radiation to the rear is served by loudspeaker 13, which exhibits one for space reasons to the funnel 14 transferred sound channel 15 (see the Abstract of Kehry, and the English translation thereof on page 1, second and third paragraphs from the bottom).

First, Kehry does not disclose a dipole loudspeaker. The loudspeakers 11 and 13 of Kehry are not described as being dipole loudspeakers. Kehry merely discloses that sound radiation to the rear is served by loudspeaker 13, but Kehry does not disclose that the loudspeakers 11 and 13 form a dipole loudspeaker.

As described in the present specification (e.g., on page 25, line 11 to page 26, line 14), a dipole loudspeaker consists of an amplified sound source 1, a control sound source 2, an acoustic

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signal source 3 and signal processing means 4. The amplified sound source 1 converts an acoustic signal from the acoustic signal source 3 to an amplified sound and radiates the amplified sound. On the other hand, the control sound source 2 converts a control sound signal from the signal processing means 4 to a control sound and radiates the control sound. With this apparatus, *interference occurs between the amplified sound from the amplified sound source 1 and the control sound source 2. Therefore, it is possible to change the directional radiation pattern.*

There is no disclosure at all in Kehry that would suggest or even hint that the loudspeakers 11 and 13 form such a dipole speaker, i.e., *there is no disclosure of a signal processing means to produce a control sound signal, or that there is interference between the output of the loudspeaker 11 and the loudspeaker 13 to control the radiation direction.* Therefore, Kehry fails to disclose or teach at least “dipole sound source provided in a vicinity of a position of a passenger wherein at least one acoustic radiation axis thereof is directed outwardly from a vehicle interior,” (emphasis added) as recited by independent claim 21.

Second, even if Kehry did disclose a dipole loudspeaker (which it does not), there is no disclosure or teaching in either reference as to why such references should or would be combined. In other words, there does not appear to be any reason why one would wish to alter the invention of Zong by incorporating the invention of Kehry. Additionally, there does not appear to be any reason why one would wish to alter the invention of Kehry by incorporating the invention of Zong. Therefore, the Examiner fails to provide motivation to combine the references, and as such the present rejections should be withdrawn.

In the present Office Action, the Examiner admits that Zong as modified by Kehry fails to disclose a signal processing means that controls phase, as claimed. The Examiner asserts that Hayakawa teaches a signal processing means that controls a phase as claimed (phase of the signal to each sound source changes with the signal processing means (page 2, paragraph 10)). The Examiner further asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to use Hayakawa's concept of a signal processing means controlling the phase in order to control the location of sound images. Applicants respectfully disagree.

Pending Claim 21 recites that “the signal processing means variably controls a phase of an input to at least one of the loudspeakers included in the dipole sound source” (emphasis added). For example, it is disclosed in the present specification, in regards to Figures 28A - 28D, that “the phase difference between the radiated sounds respectively from the loudspeakers 306

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and 307 can be varied since the phase of an acoustic signal input to at least one of the loudspeakers can be varied by the signal processing means 303. Thus, the positions in which the reproduced sounds from the loudspeakers 306 and 307 are interfered with, and canceled out by each other, *can be changed to directional radiation patterns e1 to e4. Thus, even when the loudspeaker is not provided in the vicinity of the driver 304, substantially the same effects can be obtained as those obtained when the loudspeaker is provided in the vicinity of the driver 304*" (emphasis added; see, e.g., Figures 28A - 28D, embodiment 16, page 54, line 20 to page 55, line 24 of the original specification).

Figures 28A-28D clearly show the variances in directional acoustic radiation patterns due to phase differences of 180° (in FIG. 28A), 150° (in FIG. 28B), 120° (in FIG. 28C), and 90° (in FIG. 28D). In contrast, Hayakawa merely teaches that "a character property of 8 like the broken-line section Q shown in drawing 1 can be given by inputting into the horn loudspeakers 11a and 11b of the 1st dipole sound source 11 the signal R with which phases differ 180 degrees, and -R. The same is completely said of the 2nd dipole sound source 12" (emphasis added; see, e.g., Drawing 2 and paragraph [0031] of Hayakawa).

Hayakawa does not disclose or teach *variably controlling the phase* of the input to at least one of the loudspeakers included in the dipole sound source. Hayakawa also does not disclose or suggest the changes in directional acoustic radiation patterns as shown in Figures 28A-28D of the present application, as a result of variably controlling the phase of the input.

Moreover, Applicants reiterate certain important distinctions which were discussed in the previous Reply. Zong discloses an electronic loudspeaker system, which is mounted on a transport means (Zong, claim 1). The Zong system has a characteristic wave shape generator, an attenuator, an amplifier, a loudspeaker, and a controller. This system is designed on the basis of the principle of harmony and acoustics and suitable for various transport means for safe driving (Zong, abstract). As conceded by the Office, Zong fails to disclose "a dipole sound source provided in a vicinity of a position of a passenger wherein at least one acoustic radiation axis thereof is directed outwardly from a vehicle interior" as recited in claim 21.

Kehry discloses a roof-mounted indicator device for emergency services of vehicles (providing a visual and audible warning for emergency services vehicles (i.e., police and fire services)). The roof-mounted device can operate in all weather conditions, because it has panes of glass covering the panels and loudspeaker horns (to be able to be heated) (Kehry, Title and

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Abstract). Figures 1 and 2 in Kehry illustrate this device including loudspeakers 11 and 13 behind plates 10 to prevent these loudspeakers from freezing up. The sound radiation to the rear is served by loudspeaker 13.

But Zong in view of Kehry fails to teach, advise, or suggest "a dipole sound source" as recited in claim 21. First, Kehry fails to disclose a dipole sound source, only loudspeakers 11 and 13. Loudspeaker 13 in Kehry is described as "sound radiation to the rear is served by loudspeaker 13". Neither loudspeaker 11 or 13 is described as a dipole sound source. Second, Kehry fails to disclose "the dipole sound source includes at least two loudspeakers wherein the at least two loudspeakers are arranged so that respective acoustic radiation planes thereof are directed opposite to each other" as recited in claim 21 (emphasis added).

Zong in view of Kehry also fails to teach, advise, or suggest "a dipole sound source provided in a vicinity of a position of a passenger wherein at least one acoustic radiation axis thereof is directed outwardly from a vehicle interior" as recited in claim 21 (emphasis added). First, the roof-mounted device in Kehry is located outside the interior of the vehicle (i.e., "roof-mounted"). Accordingly, loudspeakers 11 and 13 (the alleged dipole sound source) are not located in a vicinity of a position of a passenger, because the passenger would not ride on the roof of the car! Second, Kehry does not mention an acoustic radiation axis of the dipole sound source. An exemplary embodiment of a dipole sound source is described at page 25, line 11 to page 26, line 14 of the subject application, which indicates how it is possible to change the directional radiation pattern of a sound source 1. Kehry fails to mention an acoustic radiation pattern and consequently fails to disclose "at least one acoustic radiation axis thereof is directed outwardly from a vehicle interior" as recited in claim 21.

Regardless, since loudspeakers 11 and 13 are located on the roof of the vehicle, an acoustic radiation axis associated therewith cannot be directed outwardly from the vehicle interior. Based on these differences, Kehry teaches away from the claimed invention due to the exterior location of the Kehry device.

Finally, Zong in view of Kehry also fails to teach, advise, or suggest "the signal processing means variably controls a phase of an input to at least one of the loudspeakers included in the dipole sound source" as recited in claim 21, because Kehry further fails to disclose such a signal processing means.

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Therefore, Applicants assert that neither Zong, Kehry, Hayakawa, nor any combination thereof, disclose or teach all the features of claim 21. Therefore, the present rejections based on said combination of references should be withdrawn.

Claims 24-29 variously depend from claim 21, so claims 24-29 are differentiated from the cited references for the same reasons as set forth above, in addition to their own respective features.

Claim 30 is rejected as being obvious over Zong, in view of Kehry, in further view of Hayakawa, in further view of Dodge (US 4,460,061). Applicants respectfully traverse this rejection. Claim 30 depends from claim 21, so claim 30 is differentiated from the cited references for at least the same reasons as set forth above, in addition to its own respective features. Moreover, Dodge does not cure the defects of the other cited references.

Claim 33 is rejected as being obvious over Zong, in view of Kehry in further view of Hayakawa, in further view of Sharp (US 3,781,475). Applicants respectfully traverse this rejection. Claim 33 depends from claim 21, so claim 33 is differentiated from the cited references for at least the same reasons as set forth above, in addition to its own respective features. Moreover, Sharp does not cure the defects of the other cited references.

Claim 22 is rejected as being obvious over Hayakawa, in view of Greenberger, US 5,870,484 ("Greenberger"). Applicants respectfully traverse this rejection.

Applicants assert that the combination of Hayakawa and Greenberger does not teach all the features of claim 22, particularly in regards to the "non-directional sound source provided in a vicinity of a center of the dipole sound source ...", contrary to the Examiner's assertions.

The Examiner asserts that: "Greenberger discloses loudspeaker arrays with signal dependent radiation patterns and the concept wherein one array comprises a two set of speakers placed in a dipole setup and a third speaker (Figures 5b and 5c applicable to a vehicle; column 90, lines 27-32). The third speaker is obviously non-directional because there is nothing opposing its directivity. If the signal were supplied then to the dipole speaker then it would implicitly be supplied to the non-directional speaker as well" (see Point 7, pages 6-7, of the present Office Action).

Firstly, in Figures 5b and 5c of Greenberger (as cited by the Examiner), Three Element Embodiments are shown. It is clear that the middle (or third) speaker, located between the two

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speakers on either side of the Three Element systems, is of the same kind as the other two speakers.

In Figure 5b for example, 6 embodiments are shown. The third configuration (left, third down) shows three speakers all pointed toward the top of the page. Clearly, a skilled person would understand that the third (or middle) speaker indeed has directionality. Furthermore, Applicants respectfully assert that this third configuration disproves the Examiner's statement that "the third speaker is obviously non-directional because there is nothing opposing its directivity". Clearly, all three speakers in this third embodiment do not have anything opposing their directivity, and yet in fact clearly have directionality (i.e., each is directed toward the top of the page in the Figure).

In the first configuration (left, top) of Figure 5b, it is shown that the two speakers are directed in opposite directions (i.e., to the left and right sides, respectively) with a third (or middle) speaker pointing out of the page. In other words, the circle between the two speakers represents another such speaker (i.e., the third speaker) from the point of view looking into the horn or cone of the speaker.

Therefore, Applicants respectfully assert that simply because there is nothing opposing its directionality does not mean that the third speaker is non-directional, as discussed above.

Moreover, the problem that Greenberger seeks to solve with his Three Element SDR Array is different from the problem of the present invention. Particularly, Greenberger discloses that: "One of the major design challenges in automotive sound systems is to develop a system that is capable of maintaining a well balanced stereo image for all passengers in the car simultaneously ... This results in a very asymmetric arrangement where listeners are much closer to one loudspeaker than they are to the other. This often causes a problem of near side localization where the stereo image is skewed toward the closest speaker" (emphasis added; see, e.g., column 89, lines 41-49 of Greenberger). Greenberger solves this problem using SDR arrays (see, e.g., column 89, line 66 to column 90, line 35 of Greenberger).

Greenberger system is very different than the presently claimed invention. For example, as shown in Figure 25, "a sound radiated from the dipole sound source 302 and a sound radiated from the non-directional sound source 305 are interfered with, and canceled out by, each other in the vicinity of the driver 304. Thus, the radiated sound decreases, and the directional radiation pattern d becomes a unidirectional radiation pattern directed exclusively along the acoustic

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radiation main axis a. Therefore, it is possible to obtain a desirable sound environment in which a sufficient volume of sound is ensured along the acoustic radiation main axis a, while the volume of sound is reduced in the vicinity of the driver 304" (emphasis added; see, e.g., page 53, line 30 to page 54, line 8 of the original English-language specification).

The interference of the sound radiated from the dipole sound source 302 and the sound radiated from the non-directional sound source 305 occurs due to "the acoustic radiation [of the non-directional sound source being] driven to have an inverted phase from that of the acoustic radiation of the dipole sound source" (as recited in claim 22), which is understandable by a skilled person in the art.

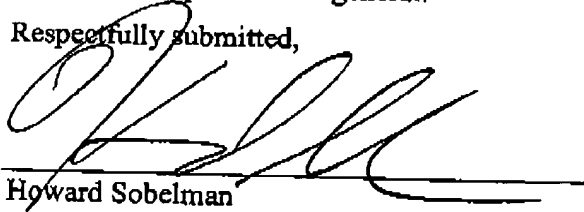
Therefore, Applicants assert that neither Hayakawa, Greenberger, nor any combination thereof, disclose or suggest at least "a non-directional sound source provided in a vicinity of a center of the dipole sound source wherein an acoustic radiation thereof is driven to have an inverted phase from that of the acoustic radiation of the dipole sound source which is directed into the vehicle interior," as recited by claim 22. As such, the present rejection of claim 22 should be withdrawn for at least the reasons above.

CONCLUSION

Thus, the Applicant respectfully submits that the present application is in condition for allowance. Reconsideration of the application is thus requested. The Commissioner is hereby authorized to charge any fees, which may be required, or credit any overpayment, to Deposit Account No. 19-2814. Applicant invites the Office to telephone the undersigned if he or she has any questions whatsoever regarding this Reply or the present application in general.

Respectfully submitted,

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